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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Harshbarger et al.

Serial No.: Not yet assigned

Filed: On Even Date Herewidth

For: ELECTRONIC DEVICES CREATED USING A METHOD OF DEPOSITING AMORPHOUS FILMS HAVING CONTROLLED CONDUCTIVITY

Group Art Unit: Not yet assigned

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PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This preliminary amendment accompanies the filing of a continuation patent application. Prior to examination, please amend the above identified application as follows:

In the Specification:

Marked up versions of all revised paragraphs, showing insertions and deletions, are included in Appendix A.

Replace the paragraph at page 1, line 6, with the following paragraph:

This application is a continuation of prior U.S. Application Serial No. 09/249,041 filed February 12, 1999, which is a continuation-in-part of U.S. Patent 5,902,650. U.S. Application Serial No. 09/249,041 and U.S. Patent 5,902,650 are hereby incorporated herein by reference.

In the Claims:

A listing of all pending claims upon entry of this amendment is included in Appendix B.

Please cancel claims 1-31.

Please add the following new claims.

32. (New) A field emission display device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

33. (New) The field emission display device of claim 32, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

34. (New) The field emission display device of claim 32, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

35. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

36. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane,

the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

37. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

38. (New) The field emission display device of claim 32, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

39. (New) The field emission display device of claim 32, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

40. (New) The field emission display device of claim 32, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

41. (New) The field emission display device of claim 32, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

42. (New) An electronic device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

43. (New) The electronic device of claim 42, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

44. (New) The electronic device of claim 42, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

45. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

46. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

47. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

48. (New) The electronic device of claim 42, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap

increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

49. (New) The electronic device of claim 42, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

50. (New) The electronic device of claim 42, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

51. (New) A flat panel display device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

52. (New) The flat panel device of claim 51, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

53. (New) The flat panel display device of claim 51, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

54. (New) The flat panel display device of claim 51, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

55. (New) The electronic device of claim 51, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

56. (New) The flat panel display device of claim 51, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

57. (New) The flat panel display device of claim 51, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

58. (New) The flat panel display device of claim 51, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

59. (New) The flat panel display device of claim 51, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

60. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

61. (New) The field emission display device of claim 60, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

62. (New) The field emission display device of claim 60, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

63. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

64. (New) The electronic device of claim 63, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

65. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

66. (New) The flat panel device of claim 65, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

67. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

68. (New) The field emission device of claim 67, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

69. (New) The field emission display device of claim 67, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

70. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

71. (New) The electronic device of claim 70, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

72. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

73. (New) The flat panel display device of claim 72, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

74. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

75. (New) The field emission display device of claim 74, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

76. (New) The field emission display device of claim 74, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

77. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

78. (New) The electronic device of claim 77, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

79. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

80. (New) The flat panel display device of claim 79, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

81. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a plasma-enhanced deposition chamber by a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

82. (New) The field emission display device of claim 81, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

83. (New) The field emission display device of claim 81, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

84. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a plasma-enhanced deposition chamber using a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

85. (New) The electronic device of claim 84, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

86. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a plasma-enhanced deposition chamber using a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

87. (New) The flat panel display device of claim 86, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

REMARKS

The above amendments delete the claims allowed in parent application 09/249,041 and add new claims 32-87. No fee is believed due for filing this amendment. However, if a fee is due, please charge such fee to Pennie & Edmonds LLP's Deposit Account No. 16-1150.

Respectfully submitted,

Date November 2, 2001

24,615 (Reg. No.)

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APPENDIX A

Changes to Specification

Page 1, line 5, please make the following changes:

[This application is a continuation-in-part of U.S. Application Serial No. 08/500,728, filed July 11, 1995, and entitled "Method of Depositing Amorphous Silicon Based Films Having Controlled Conductivity," which is incorporated herein by reference.] <u>This application is a continuation of prior U.S. Application Serial No. 09/249,041 filed February 12, 1999, which is a continuation-in-part of U.S. Patent 5,902,650. U.S. Application Serial No. 09/249,041 filed February 12, 1999, and U.S. Patent No. 5,902,650 are hereby incorporated herein by reference.</u>

APPENDIX B

Changes to Claims

Claims 1-31 are canceled.

Please add the following new claims.

32. (New) A field emission display device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

33. (New) The field emission display device of claim 32, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

34. (New) The field emission display device of claim 32, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

35. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia,

the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

36. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

37. (New) The field emission display device of claim 32, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

38. (New) The field emission display device of claim 32, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

39. (New) The field emission display device of claim 32, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

40. (New) The field emission display device of claim 32, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

41. (New) The field emission display device of claim 32, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

42. (New) An electronic device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

43. (New) The electronic device of claim 42, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

44. (New) The electronic device of claim 42, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

45. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

46. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

47. (New) The electronic device of claim 42, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

48. (New) The electronic device of claim 42, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

49. (New) The electronic device of claim 42, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

50. (New) The electronic device of claim 42, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

51. (New) A flat panel display device having a substrate fabricated according to a process that includes forming on said substrate inside a deposition chamber an amorphous silicon-based film having a tensile stress of between about 10^8 and about 10^9 dyne/cm^2, the method comprising:

introducing a silicon-based volatile into the deposition chamber;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein the conductivity-increasing and conductivity-decreasing volatile are introduced into said deposition chamber at a flow rate ratio between about 1:1 and about 1:1000 conductivity-

increasing to conductivity-decreasing volatile; thereby forming said amorphous silicon-based film on said substrate.

52. (New) The flat panel device of claim 51, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

53. (New) The flat panel display device of claim 51, wherein the flow rate ratio is selected to achieve a film resistivity of about 10^3-10^7 ohm-cm.

54. (New) The flat panel display device of claim 51, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of ammonia, the phosphine and the ammonia being introduced into the deposition chamber at a flow rate ratio in a range of about 1:1000 to about 1:10 (phosphine:ammonia).

55. (New) The electronic device of claim 51, wherein the conductivity-increasing volatile consists of phosphine and the conductivity-decreasing volatile consists of methane, the phosphine and the methane being introduced into the deposition chamber at a flow rate ratio in a range of about 1:100 to about 1:1 (phosphine:methane).

56. (New) The flat panel display device of claim 51, wherein the conductivity-increasing volatile includes an n-type dopant or a p-type dopant.

57. (New) The flat panel display device of claim 51, wherein the amorphous silicon-based film is characterized by a band gap, and the conductivity-decreasing volatile includes a band gap increasing component that increases the band gap of the amorphous silicon-based film relative to a film formed under similar conditions but without the band gap increasing component.

58. (New) The flat panel display device of claim 51, wherein the conductivity-decreasing volatile includes nitrogen or carbon.

59. (New) The flat panel display device of claim 51, the method further comprising introducing into the deposition chamber a second conductivity-decreasing volatile, wherein the silicon-based film consists of silane, the conductivity-increasing volatile consists of phosphine, the first conductivity-decreasing volatile consists of ammonia, and the second conductivity-decreasing volatile consists of methane.

60. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

61. (New) The field emission display device of claim 60, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

62. (New) The field emission display device of claim 60, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

63. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

64. (New) The electronic device of claim 63, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

65. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

introducing into a deposition chamber a silicon-based volatile;

introducing into the deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film thereby forming said amorphous silicon-based film on said substrate.

66. (New) The flat panel device of claim 65, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

67. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

68. (New) The field emission device of claim 67, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

69. (New) The field emission display device of claim 67, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

70. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

71. (New) The electronic device of claim 70, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

72. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a stress level of about 10^8 dyne/cm^2 to about 10^9 dyne/cm^2.

73. (New) The flat panel display device of claim 72, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

74. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a deposition chamber by a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

75. (New) The field emission display device of claim 74, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

76. (New) The field emission display device of claim 74, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

77. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

78. (New) The electronic device of claim 77, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

79. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a deposition chamber using a method comprising:

maintaining a silicon-based volatile at a first partial pressure in said deposition chamber;

maintaining a conductivity-increasing volatile at a second partial pressure in said deposition chamber, the conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

maintaining a conductivity-decreasing volatile at a third partial pressure in said deposition chamber, the conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; and

regulating said first, second and third partial pressures to form said amorphous silicon-based film on said substrate such that said amorphous silicon-based film has a resistivity of about 10^3 ohm-cm to about 10^7 ohm-cm.

80. (New) The flat panel display device of claim 79, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

81. (New) A field emission display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate in a plasma-enhanced deposition chamber by a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

82. (New) The field emission display device of claim 81, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

83. (New) The field emission display device of claim 81, wherein said substrate further includes an insulator layer and a metallic gate layer that are sequentially formed on said amorphous silicon-based film, and wherein said insulator layer and said metallic gate layer are etched in such a way as to form metallic microtips.

84. (New) An electronic device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a plasma-enhanced deposition chamber using a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

85. (New) The electronic device of claim 84, wherein said deposition chamber is a CVD chamber or a PECVD chamber.

86. (New) A flat panel display device having a substrate fabricated according to a process that includes forming an amorphous silicon-based film on said substrate inside a plasma-enhanced deposition chamber using a method comprising:

introducing into the plasma-enhanced deposition chamber a silicon-based volatile;

introducing into the plasma-enhanced deposition chamber a conductivity-increasing volatile including one or more components for increasing the conductivity of the amorphous silicon-based film; and

introducing into the plasma-enhanced deposition chamber a conductivity-decreasing volatile including one or more components for decreasing the conductivity of the amorphous silicon-based film; wherein:

said plasma-enhanced chemical vapor deposition process is limited to a plasma power of about 0.18 watts/cm^2 to about 0.36 watts/cm^2.

87. (New) The flat panel display device of claim 86, wherein said deposition chamber is a CVD chamber or a PECVD chamber.